Revue suisse Zool.	Tome 98	Fasc. 3	p. 581-587	Genève, septembre 1991

Description of two new species of the genus *Rivulus* (Cyprinodontiformes: Rivulidae) from eastern South American coastal plains

by

Wilson J.E.M. COSTA *

With 3 figures

ABSTRACT

Two new species of *Rivulus* from eastern Brazil are described. They are considered to be closely related to *R. santensis* Köhler, 1906, *R. haraldsiolii* Berkenkamp, 1984, *R. luelingi* Seegers, 1984 and *R. nudiventris* Costa, 1990, by sharing a unique angulo-articular shape. *Rivulus janeiroensis* n. sp. differs from closely related species by having a greater caudal fin. It has been collected within forests in small isolated basins from Estado do Rio de Janeiro. *Rivulus depressus* n. sp. is distinguished from closely related species by having greater head length and smaller depth head. It has been found in a forested small stream, near Porto Seguro, Estado da Bahia.

INTRODUCTION

The genus *Rivulus* has been recently defined as a monophyletic group by having four synapomorphies – reduced pectoral fin, juveniles with a ocellate spot on upper region of the caudal fin basis, lower tip of cleithrum anteriorly expanded and caudal vertebrae with elongated neural prezygapophysis (COSTA, 1990a). It comprises about 70 species which are distributed on southern North America, Middle America and cis-Andean South America, inhabiting rivulets, swamps and mangroves (COSTA, 1990b).

Eight species have been reported from eastern South American coastal plains – *R. ocellatus* Hensel, 1868, *R. santensis* Köhler, 1906, *R. caudomarginatus* Seegers, 1984, *R. luelingi* Seegers, 1984, *R. haraldsiolii* Berkenkamp, 1984, *R. brasiliensis* (Humboldt & Valenciennes, 1821), *R. nudiventris* Costa & Brasil, 1990, and *R. bahianus* Huber, 1990 (COSTA & BRASIL, 1990).

Rivulus santensis, *R. luelingi*, *R. haraldsiolii* and *R. nudiventris* were considered closely related species by having angulo-articular with lower process curved (COSTA &

* Dept. Biologia Marinha, Universidade Federal do Rio de Janeiro, CCS – Bloco A – Cidade Universitária, Ilha do Fundão, CEP 21941 Rio de Janeiro, Brazil.

Brasil, 1990), a characteristic not observed in other Rivulidae fishes. Two other new species from eastern Brazil, which are described in the present paper, seem to belong to this group by presenting the same angulo-articular shape.

MATERIAL AND METHODS

Methods for taking measurements and counts follow Costa (1988). Measurements are presented as percentages of standard length (SL) except for eye diameter, which is expressed as a percentage of head length.

Abbreviations for institutions are: Muséum d'Histoire naturelle, Genève (MHNG), Museu Nacional do Rio de Janeiro (MNRJ), Meseu de Zoologia da Universidade de São Paulo (MZUSP), Universidade Federal da Paraíba (UFPB) and Universidade Federal do Rio de Janeiro (UFRJ).

The distribution map (Fig. 3) is based on following material.

Rivulus santensis Köhler, 1906

Brazil, Estado de São Paulo: MZUSP 38328, 8 ex.; near Rio-Santos road, Ubatuba; J. L. Figueiredo, 4 x 1975. – MZUSP 38315, 41 ex.; 5 km N Itanhaém; B.S. Santos F., 9-10 IV 1977. – MZUSP 38385, 21 ex.; Estação Ecológica da Juréia; J.C. Oliveira, 23 II 1985. – MZUSP 35305, 2 ex.; Miracatú; O.T. Oyakawa, 29 VII 1985. – MZUSP 38316, 4 ex.; Itaguá, Ubavuba; J.L. Figueiredo, I 1974. – MZUSP 38331, 15 ex.; near Cubatão; P.S. Santos F., 20 III 1977. – MNRJ uncatalogued, 5 ex.; Juquiá; U. Caramaschi & E. Caramaschi, 28 VII 1987. – UFRJ 123, 4 ex.; Bertioga; G.C. Brasil, 1989.

Estado do Paraná: MZUSP 38359, 11 ex.; Ponta da Pita; P. S. Santos F., without date. – MZUSP 35413, 3 ex.; Paranaguá; W. J. E. M. Costa, J. Ghisolfi & M.T.C. Lacerda, 21 XII 1986.

Rivulus luelingi Seegers, 1984

Brazil, Estado de Santa Catarina: MZUSP 38311, 4 ex.; Itapoá; W.J.E.M. Costa, J. Ghisolfi & M.T.C. Lacerda, 21 XII 1986. – UFRJ 126, 4 ex.; UFRJ 127, 5 ex. and UFRJ 128. 12 ex.; Araguari; M.T.C. Lacerda, G.C. Brasil & J. Ghisolfi, 21 XI 1987.

Rivulus haraldsiolii Berkenkamp, 1984

Brazil, Estado de Santa Catarina: MZUSP 38356, 6 ex.; near Tijucas; P.S. Santos F., 5 XII 1975. – MZUSP 38357, 5 ex.; Garuva; B.S. Santos F., without date. – UFRJ 125, 8 ex.; Joinville; M.T.C. Lacerda, G.C. Brasil & J. Ghisolfi, 21 XI 1987.

Rivulus nudiventris Costa et Brasil, 1990

Brasil, Estado do Espírito Santo: MZUSP 40283, holotype and MZUSP 40284, 3 paratypes; near Itapemirim; G.C. Brasil, 19 V 1988. – MNRJ 11740, 2 paratypes; same locality; W.J.E.M. Costa G.C. Brasil & P.M.C. Araújo, 9 I 1990.

Rivulus janeiroensis, n. sp.
(Fig. 1)

Rivulus santensis (not Köhler 1906); SEEGERS, 1984 (misidentification)

Holotype: MZUSP 41383, male, 30.3 mm SL; Brazil: Estado do Rio de Janeiro: stream into forest, Rio São João basin, near Silva Jardim; W.J.E.M. Costa, G.C. Brasil, P.M.C. Araújo and C.P. Bove, 10 I 1990.

Paratypes: MZUSP 41384, 2 males, 28.8 and 32.4 mm SL and 4 females, 28.9-36.7 mm SL; collected with the holotype. – MHNG *2512.85*, 1 male, 31.8 mm SL and 1 female, 34.3 mm SL; – UFRJ 130, 1 male, about 30.0 mm SL and 1 female, about 32.0 mm SL (cleared and counterstained); Brazil: Rio de Janeiro: stream into forest, Rio Roncador basin, near Magé; W.J.E.M. Costa & K. Tanizaki, 22 XII 1989. – UFRJ 129, 2 males, 28.3 and 31.2 mm SL; Brazil: Rio de Janeiro: stream close to forest, Rio Macaé basin, near Macaé; W.J.E.M. Costa & G.C. Brasil, 13 X 1989.

Additional material (not types): UFRJ 131, 5 ex.; Brazil: Rio de Janeiro: Parque Florestal do Desengano, Rio Imbé basin; R. Pineschi, VII 1989.

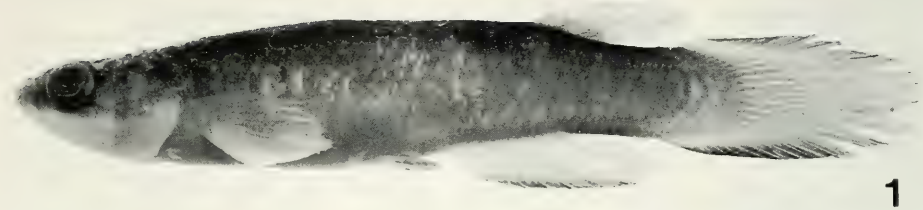
TABLE 1.

Morphometric and meristic data of *Rivulus janeiroensis* (m: male; f: female) (measurements are presented as percentage of standard length (SL) except for eye diameter which is expressed as a percentage of head length)

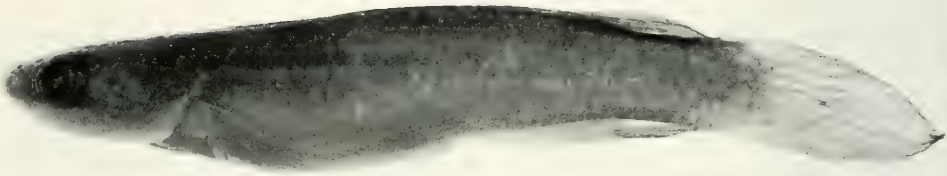
	MZUSP 41284 m	MHNG 2512.85 m	UFRJ 129 m	MZUSP 41283 m	MZUSP 41384 m	UFRJ 129 m	MZUSP 41384 f	MZUSP 4138 f	MZUSP 41384 f	MHNG 2512.85 f	MZUSP 41384 f
SL (mm	32.4	31.8	31.2	30.3	28.8	28.3	36.7	36.3	34.5	34.3	28.9
Body depth	19.6	20.2	17.9	20.1	18.8	18.9	18.1	18.5	18.0	18.2	19.2
Head length	24.6	25.4	22.9	25.1	25.7	25.5	24.0	23.6	24.2	23.2	24.4
Head depth	16.2	18.3	15.9	16.8	17.4	17.5	16.1	16.1	15.5	17.2	16.4
Head width	19.3	20.9	18.9	20.3	20.7	20.4	20.4	19.0	19.1	20.1	19.7
Eye diameter	31.4	31.1	35.7	33.6	32.4	32.6	29.5	31.0	29.9	30.2	33.3
Predorsal length	75.3	78.4	73.6	75.9	79.5	75.9	76.3	75.3	76.5	75.1	77.5
Prepelvic length	54.6	54.5	50.8	53.6	53.5	52.9	54.8	53.1	53.5	55.2	54.3
Depth of caudal peduncle	13.1	13.7	12.2	13.9	13.5	12.2	12.0	12.7	12.0	12.8	12.5
Length of dorsal fin base	8.8	9.8	9.5	10.7	8.5	9.6	9.4	8.1	10.1	10.3	9.9
Length of anal fin base	20.	23.9	20.5	18.5	22.0	22.1	18.9	18.3	21.0	19.2	18.2
Caudal fin length	39.3	39.1	38.9	40.1	37.7	38.2	36.1	35.6	33.5	34.8	35.8
Dorsal rays	7	7	6	8	7	7	8	7	8	8	8
Anal rays	13	15	13	11	13	13	13	13	14	13	13
Scales in longitudinal series	34	33	32	34	33	32	33	32	33	34	33
Scales in transversal series	8	8	7	8	8	8	8	8	8	8	8
Horizontal scale rows around caudal peduncle	16	16	16	16	16	16	16	16	16	16	16

D i a g n o s i s . – The new species is distinguished from all closely related species by the greater caudal fin length, what is more pronounced in males (37.7-40.1% SL in males and 34.8-36.1% SL in females vs. 29.4-32.9% SL in both sexes).

D e s c r i p t i o n . – Tip of dorsal and anal fins rounded. Caudal fin elliptical. Posterior margin of pectoral fin reaching to about 3/4 of distance from base of pectoral fin to anal fin origin in males and 1/2 of that distance in females. Tip of pelvic fin fin reaching to the urogenital papilla in males and to the anus in females. Dorsal fin origin opposite 9th or 10th anal ray. The meristic and morphometric data are given in TABLE 1.



1



2

FIGS 1, 2.

1: *Rivulus janeiroensis*, holotype, MZUSP 41383, male, 30.3 mm SL. *Rivulus depressus*, holotype, UFPB 2213, male, 33.0 mm Sl

C o l o u r a t i o n . – Males: sides of head greenish brown. Sides of body of the same color, with about seven longitudinal series of slightly dark brown dots and about 15 pale red transvèrsal stripes. Ventral part of head and belly almost white. Iris yellow. Opercular region greenish gold. Unpaired fins greenish yellow, anal fin with dark brown distal margin and ligth blue base, caudal fin with dark brown upper and lower margins. Pectoral and pelvic fins hyaline. Females: sides of head and body with slightly dark brown dots; sides of body with dark brown spots in the dorsal region. Ventral part of head and belly almost white. Iris brown. Unpaired fins hyaline with brown transverse stripes. Pectoral and pelvic fins hyaline. A oceollate spot in the upper part of the caudal fin basis.

E t y m o l o g y . – The name *janeiroensis* denotes the occurrence of this species in Estado do Rio de Janeiro, Brasil.

D i s t r i b u t i o n . – Isolated coastal plain basins, Municípios de Rio de Janeiro, Marica (no material conserved), Magé, Silva Jardim, Macaé and Campos, Estado do Rio de Janeiro, Brazil (Fig. 3).

FIG. 3

Eastern South America, collecting localities of *Rivulus janeiroensis*, *R. depressus* and closely related species.

Rivulus depressus n. sp.
(Fig. 3)

Holotype: UFPB 2213, male, 33.0 mm SL; Brazil: Bahia: stream into Estação Ecológica Pau-Brasil, Rio João de Tiba basin, near Porto Seguro; R.T.C. Ramos, 2 III 1986.

Paratypes: UFPB 1749, 10 males (1 cleared and counterstained), 22.0-30.0, SL and 7 females (1 cleared and counterstained) 22.0-31,5 mm SL; collected with the holotype.

D i a g n o s i s . – The new species is distinguished from all closely related species by the greater head length (26.1-28.4% SL vs. 22.3-25.7% SL) and smaller head depth (14.9-15.7% SL vs. 15.5-18.3% SL).

D e s c r i p t i o n . – Tip of dorsal and anal fins rounded. Caudal fin elliptical. Posterior margin of pectoral fin reaching to about 3/4 of distance from base of pectoral fin to anal fin origin in males and 1/2 of that distance in females. Tip of pelvic fin reaching to the urogenital papilla in males and to the anus in females. Dorsal fin origin opposite 9th anal ray. The meristic and morphometric data are given in TABLE 2.

TABLE 2.

Morphometric and meristic data of *Rivulus depressus* (M: male; f: female) (measurements are presented as percentage of standard length (SL) except for eye diameter, which is expressed as a percentage of head length)

	UFPB 2213 m	UFPB 1749 m	UFPB 1749 m	UFPB 1749 f	UFPB 1749 f	UFPB 1749 f
SL (mm)	33.0	25.5	23.6	31.5	31.3	26.1
Body depth	19.0	19.3	18.7	17.1	17.7	17.0
Head length	26.1	27.3	27.6	26.5	26.7	28.4
Head depth	14.9	15.7	15.5	15.3	15.0	15.3
Head width	18.2	20.4	20.0	19.8	19.8	20.5
Eye diameter	29.1	34.5	30.8	31.3	31.7	29.7
Predorsal length	76.0	76.2	75.8	79.1	76.2	78.7
Prepelvic length	55.2	55.2	55.6	56.4	57.7	57.3
Depth of caudal peduncle	12.7	13.2	12.7	11.8	12.1	11.3
Length of dorsal fin base	9.7	9.6	10.2	8.3	8.3	8.6
Length of anal fin base	21.5	19.4	19.7	18.4	18.1	18.6
Caudal fin length	30.6	33.8	32.4	32.5	31.0	32.9
Dorsal rays	7	7	8	7	8	7
Anal rays	13	13	13	13	14	13
Scales in longitudinal series	34	33	33	–	–	–
Scales in transversal series	8	8	8	–	–	–
Horizontal scale rows around caudal peduncle	16	16	16	–	–	–

C o l o u r a t i o n (based only on preserved specimens). – Males: sides of head and body light brown, with longitudinal series of pale brown dots on body sides. Caudal fin with horizontal dark striae. Females: sides of head and body light brown, with dark spots in dorsal region. Caudal fin with dark transverse stripes. A slight ocellate spot in the upper part of the caudal fin basis.

E t y m o l o g y . – From the Latin *depressus* (depressed), an allusion to the small head depth of the species. An adjective.

D i s t r i b u t i o n . – Known only from the type locality (Fig. 3).

DISCUSSION

Rivulus depressus, *R. nudiventris*, *R. janeiroensis*, *R. santensis*, *R. luelingi* and *R. haraldsiolii*, besides having angulo-articular with lower process curved, also share longitudinal series of dark dots on sides of body and females with transverse dark stripes on caudal fin. However, since these last characteristics are largely diffused in the genus (HOEDEMAN, 1961; FELS & DE RHAM, 1982; COSTA, 1989), they do not serve to define the group as monophyletic. The relationships among species of this group or of this group within the genus were not examined in the present study.

Acknowledgments

I am grateful to Gilberto Brasil, Paulo Araújo, Claudia Bove and Kenny Tanizaki for the field assistance; to Ricardo Rosa for loan of specimens; to Gilberto Brasil, Marco Lacerda and Renato Pineschi for donation of specimens, and to Marlene Raupp for typing the manuscript.

REFERENCES

Costa, W.J.E.M. 1988. Sistemática e distribuição do complexo de espécies *Cynolebias minimus* (Cyprinodontiformes, Rivulidae), com a descrição de duas espécies novas. *Revta Brasil. Zool.*, 5 (4): 557-570.

— 1989. Descrição de cinco novas espécies de *Rivulus* das bacias dos rios Paraná e São Francisco (Cyprinodontiformes, Rivulidae). *Revta Brasil. Zool.*, 6 (3): 513-534.

— 1990a. Análise filogenética da família Rivulidae (Cyprinodontiformes, Aplocheilidae). Revta Brasil. Biol., 50 (1): 65-82.

— 1990b. Classificação e distribuição da família Rivulidae (Cyprinodontiformes, Aplocheiloidei). *Revta Brasil. Biol.*, 50 (1): 83-89.

Costa, W.J.E.M. & G.C. Brasil. 1990. Description of a new species of *Rivulus* (Cyprinodontiformes: Rivulidae) from the Coastal Plains of Eastern Brazil. *Ichthyol. Explor. Freshwaters*, 1 (4): 379-383.

Fels, J.F. & B. de Rham. 1982. Recentes collections de *Rivulus* (Cyprinodontidés) au Peru, avec description de six nouvelles espèces. 2. *Revue fr. Aquariol.*, 8 (4): 97-106.

Hoedeman, J.J. 1961. Studies on Cyprinodontiform fishes – preliminary key to specis and subspecies of the genus *Rivulus*. *Bull. aquatic Biol.*, 2(18): 65-74.